REMARKS

Reconsideration of this patent application is respectfully requested in view of the foregoing amendments and the following remarks.

The Examiner has rejected claims 12-13, 15-16, and 21-22 under 35 U.S.C. § 102(b) as being anticipated by *Bahorich* et al hereinafter *Bahorich*.

The applicant respectfully traverses this rejection. In particular, the applicant believes that the process according to claim 21, is entirely different than that of *Bahorich*.

First *Bahorich* does not use an absolute reference section as used in claim 21. In fact, *Bahorich* does not even use the term "absolute". *Bahorich* refers to the term "cell" that can be equated with the term "section" in the present invention. The process of Bahorich involves selecting a number of cells (sections), which contains portions of at least three seismic traces. Trace similarity (i.e. coherence or 3-D continuity) is measured within each cell only from the trace portions localized within this cell. The similarity measurement in a cell is performed without any reference to any data outside the

considered cell. As shown in Fig. 2 of *Bahorich*, the reference trace portion A is localized within the cell, just as the adjacent trace portions B, C. The localized reference trace portion changes from cell to cell as the similarity is assessed across the data range. Because this localized reference trace portion makes this change, it is not an "absolute" reference section.

In contrast, with the present invention, the process involves "selecting an absolute reference". This absolute reference section is picked first and then remains unchanged during the entire similarity analysis. Thus the term "absolute" means that the term is "unconditional" meaning it is not dependent on a particular region selected in the measurement data set but rather remains fixed prior to selecting the local sections. If the process of *Bahorich* was applied to the data sets of the present invention, then there would be no "absolute reference section", but the "reference" would be a subsection of each local section which would be completely different than the process of the present invention.

In *Bahorich*, the similarity analysis is conducted on a cell by cell basis based upon the individual trace portions in each cell. This type of cell in *Bahorich* could be defined by the

points A, B, and C in Fig. 2 of *Bahorich*. It could also be shown in the attached sheet A2, for a seismic dataset defined in the attached sheet A1. Thus in *Bahorich*, the similarity analysis is individualized for each cell with a different local reference trace portion for each cell. Attached sheet A3, shows the two ways for obtaining an absolute reference section of the present invention in claim 21, either using on unchanging set of points internal to the measured data set, or one changing set of points external to the measured data set.

In the present invention, as claimed in claim 21, this absolute reference section can be outside of the measured data set including each of the local sections and this absolute reference section is then used to create a similarity analysis of a number of individual points in each local section which is shown in the attached sheet B1. Attached sheets B1, B2, B3, and B4 each show a process using an external absolute reference section, which could be used on cell or local sections a, b, c, and d.

The absolute reference section could also be an internal absolute reference section as shown in attachments C1, and C2. In these attachments, the internal absolute reference section is taken from within the measured data set but remains the same throughout the entire similarity analysis. Support for a process

using either the internal and external types of absolute reference sections can be found in the specification on the last paragraph of page 11 and in the first paragraph of page 12.

In summary, the similarity measurement in the process of *Baborich* is characterized as follows:

1. One cell (section) is considered for each similarity determination, which is a local cell (section).

2. The similarity is measured within this considered local cell (section) only.

3. There is no absolute reference that would appear unchanged in all similarity measurements.

The similarity measurement in the present invention according to claims 21 and 24 is completely different:

1. Two cells (sections) are considered for each similarity determination, which are a local cell (section), and the absolute reference cell (section).

2. The similarity is measured between the two cells

(sections).

3. An absolute reference (reference section) appears unchanged in all similarity measurements.

Just like the process of the present invention, the ultimate result of the present invention is very much different than in *Bahorich*. For example, for *Bahorich* the results could be obtained for the seismic dataset defined in the attached sheet A2, using the similarity measurements for *Bahorich*, which would render one set of values shown in attachment D1. However, using the process shown in attached sheet A3 and in the attached sheet B1 for the present invention, the results would be much different as shown in attached sheet D2. The method of *Bahorich* obtains a high similarity in homogeneous regions and a low similarity in inhomogeneous regions since only the local internal similarity is measured using an ever-changing local and not absolute reference. This is shown in attachment D1.

The process of the present invention as in claim 21, is much different, and therefore arrives at a much different result. For example, with the present invention, the similarity does not depend on homogeneity of the considered region but on the correspondence to the characteristics of the non-local and

unchanging absolute reference section. This result is shown by way of example in attachments D2 and D3.

Thus, the applicants believe that claim 21, and dependent claims 12, 13, 15-20, 22 and 23 are patentable over the above reference.

In addition, and in particular in contrast to claim 12 of this invention, *Bahorich* only discloses using one single local reference trace portion for each cell, that is the reference trace portion "A" shown in FIG. 2 of *Bahorich*. However, in the present invention, as in claim 12, each section, whether the absolute reference section, or a local section, comprises multiple trace portions, which is shown in attachments B and C. Therefore, the applicant believes that this process is entirely different than that shown in *Bahorich*.

The Examiner has rejected claims 17-20 under 35 U.S.C. 103(a) as being anticipated by Bahorich in view of Neff. The applicants believe that based upon the above explanation of the claims, claims 17-20, which depend from claim 21 are also patentable over the references cited taken either singly or in combination.

In addition, new claim 24 has been added. The applicants believe that new claim 24 is based upon claim 21, and also includes additional defining features. Therefore, the applicant believes that new claim 24 should also be allowable. In claim 24, the new feature, "center point", is disclosed in the original filed description on page 15, 2nd paragraph:

> "The calculated similarity values are then assigned as attributes to the center point of the local data section viewed at the time, and each local data point that is of interest is taken into account, if necessary across the entire 3-D data set."

In conclusion, claims 12, 13, and 15-23 remain in the application. Claim 20 has been amended to clarify its meaning. New claim 24 has been added but no new matter has been added. Accordingly, the applicants respectfully request early allowance of the remaining claims.

Respectfully submitted,

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I hereby certify that this correspondence is being faxed to the examiner, Toan M Lee at (703)872 9318 on November , 2003.

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A1

3D seismic volume model for comparison

Fig 1a - Plan view of seismic traces

This plan view illustrates a seismic volume from above. The locations of the seismic traces are denoted by X, and O.

3D seismic volume model for comparison

Fig 1b - Plan view of seismic traces (continued)

There are only two types of traces, i.e., X, and O, which are completely dissimilar, resulting in similarity values of 0 (zero). However, similarity is 1 when comparing identical traces X, and X, (or O, and O).

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A2

Baborich et al. / Example 1 : cells

Fig 2 - Plan view of seismic traces

This plan view is similar to FIG. 2 of Baborich et al. which is explained in col.1, lines 32-34:
"FIG. 2 is a plan view of a portion of a 3-D seismic volume. In order to measure discontinuity, a trace segment at one point A is compared to adjacent trace segments B and C."

Baborich et al. / Example 1 : cells

Fig 3 - Similarity measurement for cells a), b), c), d)

Trace segments are identical in cells a), b), respectively. Normalized cross-correlations AB and AC both are 1, and their geometric mean is 1 as well.
Trace segments partly differ in cells c), d), respectively. Normalized cross-correlations AB and AC yield 1 and 0, and their geometric mean is 0.
The geometric mean is assigned to the grey location.

4

A3

Trappe et al. / Example 2 : External Reference

Fig 4a - Absolute external reference section ER (left, for Example 2), which is defined outside the seismic volume to be processed.

Fig 4b - Absolute external reference section ER (right, for Example 3), which is defined outside the seismic volume to be processed.

Trappe et al. / Example 3 : Internal Reference

In the plan view of seismic traces, four trace locations a), b), c), d) are highlighted for further comparison with the similarity measurements by Babolich et al. Fig.1.

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B1

Trappe et al. / Example 2 : External Reference

Fig 5a - Similarity measurement for local section a) with absolute external reference section ER)

Arrows connect trace segments in the absolute external reference section ER), and their counterparts in the local section a), thus producing five pairs of traces. The similarity of the reference section and the local section is determined by comparing traces within each trace pair, and combining the results for a general similarity measure.

For comparison with Babovich et al., a similarity measurement is performed, yielding 1 for the comparison of identical segments **X-X** (or **O-O'**, and 0 for different segments **X-O**.

The five initial similarity values of the five trace pairs are averaged, and the resulting similarity is assigned to the grey location in the local section.

B1

6

B2

Trappe et al. / Example 2 : External Reference

Fig 5b - Similarity measurement for local section b) with absolute external reference section ER)

Arrows connect trace segments in the absolute external reference section ER), and their counterparts in the local section b), thus producing five pairs of traces. The similarity of the reference section and the local section is determined by comparing traces within each trace pair, and combining the results for a general similarity measure.

B2

7

B3

Trappe et al. / Example 2 : External Reference

Fig 5c - Similarity measurement for local section c) with absolute external reference section ER)

Arrows connect trace segments in the absolute external reference section ER), and their counterparts in the local section c), thus producing five pairs of traces. The similarity of the reference section and the local section is determined by comparing traces within each trace pair, and combining the results for a general similarity measure.

B3

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B4

Fig. 6d - Similarity measurement for local section d) with absolute external reference section ER)

Arrows connect trace segments in the absolute external reference section ER), and their counterparts in the local section d), thus producing five pairs of traces. The similarity of the reference section and the local section is determined by comparing traces within each trace pair, and combining the results for a general similarity measure.

B4

C1

Fig 6a - Similarity measurement for local section a) with absolute internal reference section IR)

Fig 6b - Similarity measurement for local section b) with absolute internal reference section IR)

Arrows connect near segments in the absolute internal reference section IR), and their counterparts in the local section a), thus producing five pairs of traces. The similarity of the reference section and the local section is determined by comparing traces within each trace pair, and combining the results for a general similarity measure.

C2

Fig 6c - Similarity measurement for local section c) with absolute internal reference section IR)

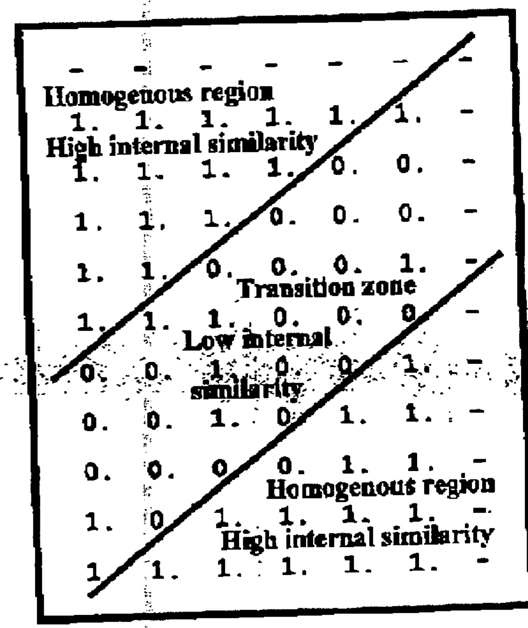
Fig 6d - Similarity measurement for local section d) with absolute internal reference section IR)

Arrows connect trace segments in the absolute internal reference section IR), and their counterparts in the local section c), thus producing five pairs of traces. The similarity of the reference section and the local section is determined by comparing traces within each trace pair, and combining the results for a general similarity measure.

D1

Bahorich et al. / Example 1 : similarity

-	-	-	-	-	-	-
1.	a) 1.	1.	1.	1.	1.	-
1.	1.	1.	1.	0.	0.	-
1.	1.	1.	0.	0.	0.	-
1.	1.	0.	0.	c) 0.	1.	-
1.	1.	1.	0.	0.	0.	-
0.	0.	1.	0.	0.	1.	-
0.	0.	1.	0.	1.	1.	-
0.	0.	d) 0.	0.	1.	1.	-
1.	0.	1.	1.	1.	b) 1.	-
1.	1.	1.	1.	1.	1.	-



13

Fig 7 - Similarity for Example 1

Local internal similarity is calculated within cells according to Fig. 3.

Note the following:
- cells a), b) in homogeneous regions yield high similarity 1,
- cells c), d) in inhomogeneous regions yield low similarity 0.

D2

Trappe et al. / Example 2 : Similarity

Fig 8 - Similarity for Example 2 / External reference

Similarity to the absolute external reference is calculated for local sections according to Fig. 4a, 5a-c.

Note the following:
- cells a), b) in homogeneous regions yield medium similarity 0.4-0.6,
- cell c) in inhomogeneous region yields high similarity 1.
- cell d) in inhomogeneous region yields low similarity 0.2.

D3

Fig 9 - Similarity for Example 3 / Internal reference

Similarity to the absolute internal reference is calculated for local sections according to Fig. 4b, 6a-d.

Note the following:
- cell a) in homogeneous region yields high similarity 1,
- cell b) in homogeneous region yields low similarity 0,
- cells a),d) in inhomogeneous regions yield low similarity 0.4.